Clinical and laboratory characteristics of COVID-19 cases at the pandemic hospital of an anatolian province

Clinical and laboratory characteristics of cases with COVID- 19

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Abstract

Aim: Biochemical monitoring of COVID-19 patients is essential for assessing disease diagnosis, severity and progression, as well as monitoring therapeutic intervention. In this study, we aimed to investigate the clinical and laboratory characteristics of the cases followed up with the diagnosis of COVID-19.
Material and Methods: The study included 110 patients who admitted to Kastamonu State Hospital between 1-30 April, 2020 and diagnosed with COVID-19. Demographic, clinical and laboratory data of the patients were evaluated retrospectively.
Results: According to the presence of pneumonia, an increase in neutrophil, ALT and creatinine values, and a decrease in the leukocyte count were found to be statistically significant. When we took the cut-off value of 28.49 for CRP, 1.45 for NLR and 111.12 for PLR in our ROC analysis, all three values were found to be associated with pneumonia. In the logistic regression analysis, female gender, age over 50 years, and an NLR value above 1.45 increased the risk of pneumonia 2.6, 4.9, and 8.3 times, respectively.
Discussion: High NLR, CRP and PLR values were found to be associated with the presence of pneumonia.

Keywords

COVID-19, Pneumonia, Laboratory

Introduction

Coronaviruses are enveloped and single-stranded RNA viruses and are a large family of viruses that are infectious in humans and animals. At the end of 2019, a new type of coronavirus was first identified as the cause of pneumonia in Wuhan, China's Hubei province. The disease caused by this virus, which spread rapidly and caused an epidemic throughout China, was named COVID-19 by the World Health Organization in February 2020, which means 2019 Coronavirus Disease [1].

COVID-19 is a global pandemic caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). As the number of individuals infected with COVID-19 continues to increase globally and its effects on health systems are observed, it is clear that clinical laboratories will play an important role, contributing to patient screening, diagnosis, follow-up and treatments [2].

Biochemical monitoring of COVID-19 patients is essential for assessing disease diagnosis, severity and progression, as well as monitoring therapeutic intervention. Defining laboratory tests that will contribute to the diagnosis and follow-up of COVID-19 patients is very important in terms of distinguishing between severe and non-severe cases, and identifying those at low or high mortality risk, in addition to the stage of diagnosis [3].

In this study, it was aimed to investigate the clinical and laboratory characteristics of cases followed up with the diagnosis of COVID-19 in April 2020 in the city of Kastamonu, located in Turkey in the western Black Sea.

Material and Methods

This study included 110 patients who admitted to Kastamonu State Hospital, which is the only pandemic hospital in Kastamonu, between 1-30 April 2020 and diagnosed with COVID-19. Demographic, clinical and laboratory data of the patients were evaluated retrospectively.

The data of the patients were accessed through the Public Health Management System. Approval for the study was obtained from the Turkish Ministry of Health, General Directorate of Health Services (Application number: 2020-05-09T13_45_21).

The diagnostic process in the study was carried out according to the diagnosis and treatment guidelines of the World Health Organization and the Turkish Ministry of Health. The patients were stratified into two groups: patients with and without pneumonia.

NLR and PLR were calculated as NLR = ratio of neutrophil count to lymphocyte count, PLR = ratio of platelet count to lymphocyte count.

Frequency and percentage were used as descriptive statistics for categorical data, and Chi-square, Fischer Exact and Cochran-Mantel-Haenszel tests were used for analysis of categorical data. Student T Test was used to analyze numerical data consisting of two groups. Logistic regression analysis was used for multiple variables. Receiver operating characteristic (ROC) analysis was performed to evaluate the cutoff values for continuous numerical variables. Statistical Package for the Social Sciences (SPSS) Version 20.0 (SPSS Inc., Chicago, IL, USA) program was used for statistical analysis. P <0.05 was considered significant.

Results

The mean age of the 110 patients included in our study was 40.2 ± 19.4 (min = 1, max = 90) years. The number of male patients was higher than the number of female patients (55.5% vs. 45.5%); 29.1% of the patients were healthcare personnel, 86.4% were urban residents, 13.6% were of foreign origin, 33.6% were in contact with a person previously diagnosed with COVID-19. Considering the clinical features, 56.4% of the patients were found to have pneumonia, only 3.6% of the 110 patients included in our study received intensive care treatment and 1.8% were intubated. Looking at the complaints at the time of application, 87.3% of the patients had at least one complaint. The most common complaints were dry cough (56.4%), fatigue (37.3%), muscle pain (36.4%), sore throat (23.6%) and shortness of breath (22.7%). While 98.2% of the patients were discharged with complete recovery, 1.8% of them died.

When the presence of pneumonia and biochemical parameters were compared, the presence of an excess of neutrophils (p <0.001), low lymphocyte count (p = 0.008), ALT elevation (p = 0.001), high creatinine (p = 0.028) and NLR elevation (p = 0.010) were statistically significant with the presence of pneumonia (Table 1).

In the ROC analysis, NLR (p <0.001), CRP (p = 0.001) and PLR (p = 0.002) values were found to be statistically significant. When the cut-off value is 1.45 for NLR, the area under the curve was 0.73, indicating a moderately useful diagnostic test. When the cut-off value for CRP was 28.49, the area under the curve was found to be 0.69, indicating a poor diagnostic test. When the cut-off value for PLR was taken as 111.12, the area under the curve was found to be 0.68, indicating a poorly useful diagnostic test (Table 2 and Figure 1).

When the relationship between the presence of pneumonia and NLR, PLR and CRP values were examined, a significant relationship was found between high NLR (p <0.001), PLR (p = 0.001) and CRP (p = 0.001) and the presence of pneumonia. According to the Mantel-Haenszel Test Odds Ratio estimate, individuals over the age of 50, in women, and with an NLR ratio of 1.45 and above have a 6.41-fold risk of pneumonia (Common OR, CI: 2.32-17.72) (very significant level of significance (p <0.001)) than those who do not have these 3 characteristics.

Individuals with a CRP equal to or above 28.49 and an NLR of 1.45 and above are 4.18 times more likely to have pneumonia

Table 1. Comparison of biochemical parameters with the presence of pneumonia

Variable	Pneumonia	n	Mean	Sd	df	t	p
Neutrophil count	Yes	62	3.86	1.82	108	3.591	<0.001
	No	48	2.83	0.89			
Lymphocyte count	Yes	62	2.15	0.65	108	-2.701	0.008
	No	48	2.58	1.02			
ALT	Yes	62	33.3	23.4	108	3.395	0.001
	No	48	21.2	8.99			
Creatinine	Yes	62	0.76	0.18	108	2.221	0.028
	No	48	0.68	0.19			
NLR	Yes	62	2.48	3.60	65.832	2.665	0.010
	No	48	1.24	0.63			

Table 2. ROC Analysis

Variables	Area under curve	Cut-off value	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Positive likelihood ratio	Negative likelihood ratio
NLR	0.73 (<0.001)	1.45	87.1	52.1	64.5	80.1	1.81	0.24
CRP	0.69 (=0.001)	28.49	72.6	60.4	64.7	68.7	1.83	0.45
PLR	0,68 (=0.002)	111.12	85.5	45.8	61.2	70.9	1.57	0.31

PPV: Positive Predictive Value, NPV: Negative Predictive Value

Table 3. Logistic regression

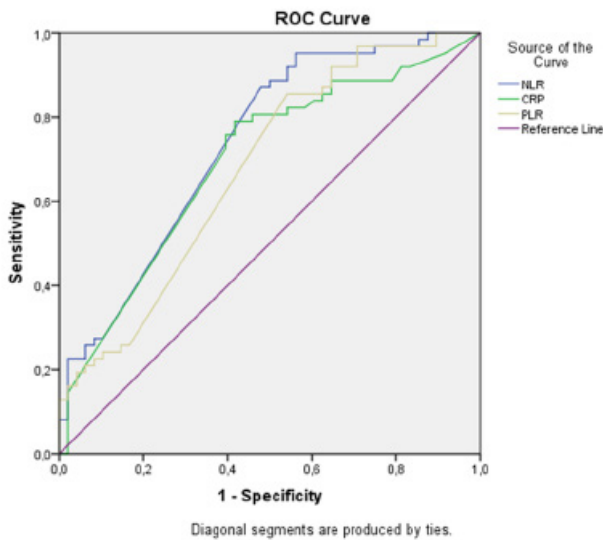| Independent variable		Beta	Standard error	p	Odds ratio	%95 CI
Gender	Female	0.965	0.485	0.047	2.624	1.015-6.787
	Male				1 (reference)	
Age	Over 50	1.579	0.577	0.006	4.852	1.566-15.035
	Below 50				1 (reference)	
NLR	1,45 and above	2.111	0.555	<0.001	8.257	2.784-24.491
	Below 1,45				1 (reference)	

Figure 1. ROC Curve

than those who do not have these three characteristics (Common OR, CI: 1.21-14). , 40) significantly (p = 0.023).

When the Odds Ratios for pneumonia risk were examined in logistic regression analysis, in women, the risk increased 2.62 times (95% CI 1.01-6.78), the age 50 years and over increased 4.85 times (95% CI 1.56-15.03), NLR 1.45 and over increased 8.25 times (95% CI 2.78-24.49) (Table 3).

Discussion

The average age of 110 patients included in our study was 40. The average age of patients according to a review study published in Turkey was 50 [4]. The low average age of the patients in our study was attributed to the general curfew above the age of 65 at the time of the study. Women accounted for 45% of our patients, and 55% were men. According to the same article, 48% of reported cases in Turkey were female and 52% were male [4]. Almost 30% of our cases were healthcare professionals. This high rate was attributed to the low number of daily tests performed at the time of our study and the healthcare personnel's easier access to the tests. At the same time, healthcare professionals are regularly tested.

The most common complaints in our patients were dry cough (56%), fatigue (37%), muscle pain (36%), sore throat (24%), shortness of breath (23%). In a meta-analysis study, 58% of patients complained of dry cough, 31% of fatigue, 17% of muscle pain, 12% of sore throat, 23% of shortness of breath [5]. In the analysis performed according to the presence of pneumonia, an increase in neutrophil, ALT and creatinine values, and a decrease in the leukocyte count were found to be statistically significant. In a meta-analysis study on the subject, a 1.33-fold increase in neutrophil count, a 1.34-fold increase in ALT, a 1.09-fold increase in creatinine, and a 1.44-fold decrease in lymphocyte count were reported in severe patients compared to non-severe patients [6].

When we took the cut-off value of 28.49 for CRP, 1.45 for NLR and 111.12 for PLR in our ROC analysis, we obtained the highest sensitivity and specificity values. When we tested these cut-off values in our patients with and without pneumonia, all three values were found to be associated with the presence of pneumonia. In logistic regression analysis, female gender, age over 50 years, and an NLR value above 1.45 increased the pneumonia risk 2.6, 4.9, and 8.3 times, respectively. A study conducted in Denizli province in Turkey found that advanced age and high NLR values independently predict inpatient treatment [7]. In a study conducted in Sakarya province, statistical significance was determined between mortality and CRP, NLR and PLR values. The cut- off values calculated in that analysis were 67.78 mg / dl for CRP, 3.9 for NLR and 148.85 for PLR [8]. In a study conducted in China, the median NLR value in severe patients was dramatically higher than in non-severe patients (10.4 vs 2.6; P < 0.001). The NLR value equal to 5 was a boundary value worthy of reference, because more than 80% of severe patients had an NLR value greater than 5, and over 80% of non-severe patients had an NLR value less than 5 [9]. In another study conducted in Istanbul, the optimal NLR and PLR cut-off values for detecting prognosis were 6.27 and 312, respectively [10].

According to the COVID-19 guide published by the Turkish Ministry of Health, there is male dominance (male/female: 2: 1)

in patients with severe disease (T.R. Ministry of Health, General Directorate of Public Health. Management of COVID-19 (SARS-CoV-2 Infection) Severe Pneumonia, ARDS, Sepsis and Septic Shock. Ankara, Turkey: T.C. Ministry of Health Publications, 2020: 6-7. In Turkish). In our study, we can attribute female dominance to the low amount of data.

Conclusion

In our study, high NLR, CRP and PLR values were found to be associated with the presence of pneumonia. It is thought that these parameters can help physicians to decide on the treatment planning of their patients due to their low cost, short time and easy operation. Considering the limitations of our study, the retrospective nature of our study may have caused selection bias. The small number of patients indicates the need for larger studies.

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